CLAIMS

1. A semiconductor device with an edge termination structure, comprising:

a semiconductor body (1, 3) having opposed first (5) and second (7) surfaces and an edge termination region (15) at the periphery of the semiconductor body;

a plurality of edge termination trenches (17) extending across the edge termination region of the semiconductor body (1, 3) and vertically from the first surface (5) towards the second surface (7) of the semiconductor body through a region of a first conductivity type;

conductive material (20, 60) extending vertically at the edge termination trenches for depleting the region of a first conductivity type between adjacent trenches;

insulating material (19, 62) extending vertically at the edge termination trenches;

surface implants (21) of second conductivity type opposite to the first conductivity type extending parallel to and along both sides of the edge termination trenches (17) adjacent to the first surface; and

an electrically conductive path (23, 41, 43) associated with each edge termination trench (17) forming an electrical connection between the surface implants (21) on both sides of the edge termination trench (17).

2. A semiconductor device according to claim 1 wherein the conductive material (20) extending vertically at the trenches is semiconductor material of the second conductivity type.

3. A semiconductor device according to claim 1 or 2 wherein the electrically conductive path (23, 41, 43) is formed by a conductive layer (41) filling at least the portion of the edge termination trenches adjacent to the first surface.

4. A semiconductor device according to claim 1 or 2 wherein the electrically conductive path (23, 41, 43) is formed by a conductive layer (23, 43) extending over the first surface transversely across the edge termination trenches between the surface implants on both sides of the edge termination trenches.

5. A semiconductor device according to any preceding claim wherein

the edge termination trenches (17) have sidewalls (18);

the conductive material (20) is a conductive layer along the sidewalls (18) of the edge termination trenches extending downwards from the surface implants on both sides of the trench; and

the insulating material (19, 62) fills the trenches between the conductive layers on the sides of the trench.

6. A semiconductor device according to any of claims 1 to 4 wherein the edge termination trenches have sidewalls (18);

the insulating material (19, 62) is an insulating layer extending downwards on the sidewalls (18) of the edge termination trenches;

the conductive material (20, 60) fills the trench between the insulating material on the sidewalls.

7. A semiconductor device according to any preceding claim wherein the electrically conductive path (23) is of doped polysilicon.

8. A semiconductor device according to any preceding claim wherein:

the semiconductor body has a central active device region (11) and a periphery (13);

the edge termination region (15) surrounds the central region of the semiconductor device within the periphery (13); and

the plurality of trenches (17) have different depths, the trenches (17) adjacent to the central region (11) of the semiconductor device being deeper than the trenches (17) adjacent to the periphery.

9. A semiconductor device according to any preceding claim, wherein the semiconductor device has an active device region (11) including a plurality of active region trenches (70) extending laterally across the active device region and vertically from the first surface towards the second surface.

10. A method of manufacture of a semiconductor device, including

providing a semiconductor body having opposed first (5) and second (7) surfaces and a semiconductor region (1, 3) of first conductivity type adjacent to the first surface;

forming trenches (17, 70) extending laterally across the semiconductor body and vertically from the first surface towards the second surface;

forming vertically extending conductive material (20, 60) and insulating material (19, 62) at each of the trenches;

forming conducting semiconductor regions (21) of second conductivity type opposite to the first conductivity type along both sides of the trenches (17) in an edge termination region (15); and

depositing conductive material on the first surface at the trenches to form a conductive path between the conducting semiconductor regions on both sides of the trenches.